

**I claim:**

1. A hitch ball assembly for towing a trailer comprising:
  - (A) a mounting element adapted to be secured to a vehicle, said mounting element including an upright post having a cylindrical free end portion with a selected diameter and extending along a longitudinal axis, said free end portion having a key structure disposed thereon of a selected size and shape;
  - (B) a hitch ball element having
    - (1) a passageway extending along a rotational axis with an entryway that is keyed to the size and shape of said key structure such that in a first rotational orientation, said free end portion may be inserted into the passageway of said hitch ball element to define a mated state and removed from the passageway, and
    - (2) an internal cavity communicating with the passageway and configured to permit relative rotation of said hitch ball element on said free end portion when in the mated state between the first rotational orientation and a second rotational orientation wherein said key structure is trapped in the cavity such that said hitch ball element and said free end portion cannot be disengaged from one another;
  - (C) a latch notch located on one of said hitch ball element and said mounting element; and
  - (D) a latch element disposed on another of said hitch ball element and said mounting element and movable between a latch position and an unlatch position such that, when said hitch ball element and said free end portion are in the mated state with said hitch ball element in the second rotational orientation, said latch element can be moved

(1) into the latch position so as to engage the notch and thereby prevent said hitch ball element from moving from the second rotational orientation to the first rotational orientation, and

(2) into the unlatch position permitting rotation of said hitch ball element from the second rotational orientation to the first rotational orientation.

2. A hitch ball assembly according to claim 1 wherein the passageway includes a cylindrical bore diametrically opposite the entryway and having a bore diameter sized for close-fitted mating with said free end portion.

3. A hitch ball assembly according to claim 1 wherein said mounting element includes a base and a mounting shank extending from said base, said upright post extending from said base oppositely of said mounting shank.

4. A hitch ball assembly according to claim 1 wherein said key structure includes at least one ear projecting radially outwardly of said free end portion to define a radial ear dimension and an ear height in a longitudinal direction.

5. A hitch ball assembly according to claim 4 wherein said entryway has a circular central opening of an opening diameter that is less than the radial ear dimension yet sized to receive said free end portion, said entryway having at least one channel extending from the circular opening to the cavity and sized to permit passage of said ear therethrough when said hitch ball element is in the first rotational position.

6. A hitch ball assembly according to claim 5 wherein said internal cavity is annular with an outer cavity diameter that is greater than the radial ear dimension and an inner cavity diameter that is less than the radial ear dimension.

7. A hitch ball assembly according to claim 6 wherein the annular internal cavity has a depth greater than the ear height.

8. A hitch ball assembly according to claim 1 wherein said hitch ball element has a spherical outer surface at a sphere radius, and wherein said latch element has a curved surface formed generally at the sphere radius and being mounted such that, when said hitch ball element and said free end portion are in the mated state and said latch element is in the latch position, the curved surface forms a continuation of the spherical outer surface of said hitch ball element.

9. A hitch ball assembly according to claim 1 wherein said latch element is pivotally mounted on said hitch ball element.

10. A hitch ball assembly according to claim 9 wherein said free end portion terminates in a transverse face, the latch notch being defined by a slot located in the transverse face.

11. A hitch ball assembly according to claim 10 wherein a spring clip is located within said slot whereby said spring clip mechanically grips the latch element in the latch position.

12. A hitch ball assembly according to claim 1 wherein said latch element is pivotally mounted on said free end portion.

13. A hitch ball assembly according to claim 12 wherein said free end portion includes a pair of spaced-apart supports in opposed relation to one another, said latch element being disposed between said supports on an axle pin.

14. A hitch ball assembly according to claim 13 wherein said latch element has an elongate slot formed therethrough and sized for loose-fitted, sliding engagement with said axle pin.

15. A hitch ball assembly for towing a trailer comprising:

(A) a mounting element adapted to be secured to a vehicle, said mounting element including an upright post having a cylindrical free end portion with a selected diameter and extending along a longitudinal axis, said free end portion including a pair of ears projecting radially outwardly therefrom and oppositely one another to define an ear diameter;

(B) a hitch ball element having

(1) a passageway extending along a rotational axis with an entryway having a circular central opening that is sized to receive the free end portion of said post and having a pair of longitudinally extending channels that are sized to receive said ears for passage therethrough, such that in a first rotational orientation, said free end portion may be inserted into the passageway of said hitch ball element to define a mated state and removed from the passageway, and

(2) an internal cavity communicating with the passageway and having a cavity diameter that is greater than the ear diameter such that the cavity is configured to permit relative rotation of said hitch ball element on said free end portion when in the mated state between the first rotational orientation and a second rotational orientation wherein said ears are trapped in the cavity such that said hitch ball element and said free end portion cannot be disengaged from one another;

(C) a latch notch located on one of said hitch ball element and said mounting element; and

(D) a latch element disposed on another of said hitch ball element and said mounting element and movable between a latch position and an unlatch position such that, when said hitch ball element and said free end portion are in the mated

state with said hitch ball element in the second rotational orientation, said latch element can be moved

(1) into the latch position so as to engage the notch and thereby prevent said hitch ball element from moving from the second rotational orientation to the first rotational orientation, and

(2) into the unlatch position permitting rotation of said hitch ball element from the second rotational orientation to the first rotational orientation.

16. A hitch ball assembly for towing a trailer according to claim 15 wherein said hitch ball element has a spherical outer surface at a sphere radius, and wherein said latch element has a curved surface formed generally at the sphere radius and being mounted such that, when said hitch ball element and said free end portion are in the mated state and said latch element is in the latch position, the curved surface forms a continuation of the spherical outer surface of said hitch ball element.

17. A hitch ball assembly for towing a trailer according to claim 15 wherein said latch element is pivotally mounted on said hitch ball element.

18. A hitch ball assembly for towing a trailer according to claim 17 wherein said free end portion terminates in a transverse face, the latch notch being defined by a slot located in the transverse face.

19. A hitch ball assembly for towing a trailer according to claim 18 wherein a spring clip is located within said slot whereby said spring clip mechanically grips the latch element in the latch position.

20. A hitch ball assembly for towing a trailer according to claim 15 wherein said latch element is pivotally mounted on said free end portion.

21. A hitch ball assembly for towing a trailer according to claim 20 wherein said free end portion includes a pair of spaced-apart supports in opposed relation to one another, said latch element being disposed between said supports on an axle pin.

22. A hitch ball assembly for towing a trailer according to claim 21 wherein said latch element has an elongate slot formed therethrough and sized for loose-fitted, sliding engagement with said axle pin.

23. In a tow hitch adapted for towing a trailer, the improvement comprising a hitch ball assembly including:

(A) an upright post having a cylindrical free end portion with a selected diameter and extending along a longitudinal axis, said free end portion having a key structure disposed thereon of a selected size and shape;

(B) a hitch ball element having

(1) a passageway extending along a rotational axis with an entryway that is keyed to the size and shape of said key structure such that in a first rotational orientation, said free end portion may be inserted into the passageway of said hitch ball element to define a mated state and removed from the passageway, and

(2) an internal cavity communicating with the passageway and configured to permit relative rotation of said hitch ball element on said free end portion when in the mated state between the first rotational orientation and a second rotational orientation wherein said key structure is trapped in the cavity such that said hitch ball element and said free end portion cannot be disengaged from one another;

(C) a latch notch located on one of said hitch ball element and said upright post; and

(D) a latch element disposed on another of said hitch ball element and said upright post and movable between a latch position and an unlatch position such that, when said hitch ball element and said free end portion are in the mated state with said hitch ball element in the second rotational orientation, said latch element can be moved

(1) into the latch position so as to engage the notch and thereby prevent said hitch ball element from moving from the second rotational orientation to the first rotational orientation, and

(2) into the unlatch position permitting rotation of said hitch ball element from the second rotational orientation to the first rotational orientation.

24. In a tow hitch adapted for towing a trailer, the improvement comprising an interchangeable hitch ball assembly including:

(A) an upright post having a cylindrical free end portion with a selected diameter and extending along a longitudinal axis, said free end portion having a key structure disposed thereon of a selected size and shape, and a latch notch located on said post, and;

(B) at least two hitch ball elements of different sizes, each said hitch ball element having

(1) a passageway extending along a rotational axis with an entryway that is keyed to the size and shape of said key structure such that in a first rotational orientation, said free end portion may be inserted into the passageway to define a mated state and removed from the passageway,

(2) an internal cavity communicating with the passageway and configured to permit relative rotation of said hitch ball element on said free end portion when in the mated state between the first rotational orientation and a second rotational orientation wherein said key structure is trapped in the cavity such that said hitch ball element and said free end portion cannot be disengaged from one another, and

(3) a latch element movable between a latch position and an unlatch position such that, when said hitch ball element and said free end portion are in the mated state with said hitch ball element in the second rotational orientation, said latch element can be moved

- (a) into the latch position so as to engage the notch and thereby prevent said hitch ball element from moving from the second rotational orientation to the first rotational orientation, and
- (b) into the unlatch position permitting rotation of said hitch ball element from the second rotational orientation to the first rotational orientation.

25. A hitch ball assembly according to claim 24 wherein said key structure includes a pair of ears projecting radially outwardly of said free end portion and opposite one another to define a radial ear dimension and an ear height in a longitudinal direction.

26. A hitch ball assembly according to claim 24 wherein the entryway of each of said hitch ball elements has a circular central opening of an opening diameter that is less than the radial ear dimension yet sized to receive said free end portion, the entryway having at least two channels extending from the circular

opening to the cavity and sized to permit passage of said ears therethrough when a respective said hitch ball element is in the first rotational position.

27. A hitch ball assembly according to claim 26 wherein said internal cavity is annular with an outer cavity diameter that is greater than the radial ear dimension and an inner cavity diameter that is less than the radial ear dimension.

28. In a tow hitch adapted for towing a trailer, the improvement comprising an interchangeable hitch ball assembly including:

(A) an upright post having a cylindrical free end portion with a selected diameter and extending along a longitudinal axis, said free end portion having a key structure disposed thereon of a selected size and shape;

(B) at least two hitch ball elements of different sizes, each said hitch ball element having

(1) a passageway extending along a rotational axis with an entryway that is keyed to the size and shape of said key structure such that in a first rotational orientation, said free end portion may be inserted into the passageway to define a mated state and removed from the passageway, and

(2) an internal cavity communicating with the passageway and configured to permit relative rotation of said hitch ball element on said free end portion when in the mated state between the first rotational orientation and a second rotational orientation wherein said key structure is trapped in the cavity such that said hitch ball element and said free end portion cannot be disengaged from one another;

(3) a latch notch disposed therein; and

(C) a latch element disposed on said upright post and movable between a latch position and an unlatch position such that, when a respective said hitch ball

element and said free end portion are in the mated state with the respective said hitch ball element in the second rotational orientation, said latch element can be moved

- (1) into the latch position so as to engage the notch and thereby prevent the respective said hitch ball element from moving from the second rotational orientation to the first rotational orientation, and
- (2) into the unlatch position permitting rotation of the respective said hitch ball element from the second rotational orientation to the first rotational orientation.

29. A hitch ball assembly according to claim 28 wherein said key structure includes a pair of ears projecting radially outwardly of said free end portion and opposite one another to define a radial ear dimension and an ear height in a longitudinal direction.

30. A hitch ball assembly according to claim 28 wherein the entryway of each said hitch ball element has a circular central opening of an opening diameter that is less than the radial ear dimension yet sized to receive said free end portion, the entryway having at least two channels extending from the circular opening to the cavity and sized to permit passage of said ears therethrough when the respective said hitch ball element is in the first rotational position.

31. A hitch ball assembly according to claim 30 wherein said internal cavity is annular with an outer cavity diameter that is greater than the radial ear dimension, and with an inner cavity diameter that is less than the radial ear dimension, and wherein said annular cavity has a depth greater than the ear height.

32. An interchangeable hitch ball assembly for towing a trailer comprising:

- (A) a mounting element adapted to be secured to a vehicle, said mounting element including an upright post having a cylindrical free end portion with a selected diameter and extending along a longitudinal axis, said free end portion having a key structure disposed thereon of a selected size and shape;
- (B) at least two hitch ball elements of differing sizes and each having
  - (1) a passageway extending along a rotational axis with an entryway that is keyed to the size and shape of said key structure such that in a first rotational orientation, said free end portion may be inserted into the passageway of said hitch ball element to define a mated state and removed from the passageway, and
  - (2) an internal cavity communicating with the passageway and configured to permit relative rotation of said hitch ball element on said free end portion when in the mated state between the first rotational orientation and a second rotational orientation wherein said key structure is trapped in the cavity such that said hitch ball element and said free end portion cannot be disengaged from one another;
- (C) a latch notch located on all of said hitch ball elements or on said mounting element; and
- (D) a latch element disposed on another of all of said hitch ball elements and said mounting element and movable between a latch position and an unlatch position such that, when said hitch ball element and said free end portion are in the mated state with said hitch ball element in the second rotational orientation, said latch element can be moved

- (1) into the latch position so as to engage the notch and thereby prevent said hitch ball element from moving from the second rotational orientation to the first rotational orientation, and
- (2) into the unlatch position permitting rotation of said hitch ball element from the second rotational orientation to the first rotational orientation.